GEOLOGICAL SOCIETY OF MINNESOTA

N E W S

SUMMER 2005
VOLUME LIX NO. 2
http://www.gsmn.org

INSIDE…

FIELD TRIPS

So far this year, we have two field trips "tentatively" scheduled for July and August. A two-day trip to the North shore may take place July 16-17, with Richard Ojakangas (U of M – retired) as our leader.

A geological walking tour of Saint Paul, lead by guides from the Science Museum, GSM, and the Minnesota Mineral Society is planned to take place August 21st.

Plans for these "tentative" field trips could not be finalized prior to the printing of this newsletter, so watch the GSM website for updates. Also, prior to each trip you should receive a notice in the mail.

Sloan authors new book

Our fellow GSM member, and friend, Robert Sloan, has written another book. This one is called "Minnesota Fossils and Fossiliferous Rocks". The book is hot off the presses, and is available only from Bob. It is 220 pages, spiral bound, and has a soft cover.

The book contains numerous full-page plates and the chapters are specific to Geologic periods. The largest chapter is on the Late Ordovician, and includes Minnesota locations where the fossils can be found.

If you would like to purchase an autographed copy, sight unseen, Bob would be more than happy to sell you one. You can send your request and payment of $30 to Robert Sloan, 39072 Karen Court, Winona MN 55987. Or, if you would like to wait until the fall lecture series begins, Bob will bring some copies of his new book to one of the lectures, and you can purchase one for $25 at that time. (More details about that in the August Newsletter.) We will have a copy of the book at the State Fair Booth too.

Announcements

State Fair Aug. 25 – Sept. 5

State Fair Booth Worker Recruitment – Ongoing

Field Trips: See page 1 for details

June 21: Summer Solstice

WANTED: Volunteer to take over the newsletter Editor's Job. If interested, contact the current editor, listed below.

GSM *NEWS*
Editor: xxxxxxxx
xxxxxxxxxxx

The purpose of this newsletter is to inform members and friends of the activities of the Geological Society of Minnesota. GSM *NEWS* is published four times a year: February 15, May 15, August 15, and November 15. GSM *NEWS* welcomes unsolicited Geology and Earth Science related articles and photographs. Deadline for article submission is three weeks before the date of publication. Contact the Editor if you have something you would like to submit for consideration.

The Importance of Rocks, Minerals and Soils for Human and Animal Health

Every day we eat, drink and breathe minerals and trace elements, never giving a thought to what moves from the environment and into our bodies. The fundamental building blocks of the earth – rocks and minerals –must have a bearing on the human and animal populations that live on them. Interaction with natural materials is harmless for most of us, but for some, the interaction with minerals and trace elements can have devasting, even fatal effects

The impacts of geologic materials on human health have been recognized for thousands of years. Hippocrates and other Hellenic writers recognized that environmental factors affected geographical distributions of human diseases 2,400 years ago. In 300 B.C., Aristotle noted lead poisoning in miners. And inhaled soot particles were detected in preserved lung tissue from the Tyrolean Iceman, which is at least 5,000 years old. He may have suffered from respiratory ailments after he inhaled tiny mineral crystals, including quartz grains.

Dusts have long been linked to human health problems. One example is the link between disease and certain dusts containing asbestos. Inhaling asbestos can cause asbestosis, a fibrosis of the lungs, as well as lung cancer and malignant mesothelioma. Much of the regulatory and remediation focus on asbestos in the 1970's and 1980's was on the morphology and size of asbestiform materials commonly found in industrial or commercial applications. These include the serpentine mineral chrysotile, the most commonly used, and the asbestiform varieties of several of the amphibole minerals including grunerite (known commercially as amosite), reibeckite (known as crocidolite, or blue asbestos); anthophyllite; tremolite, and actinolite.

In the 1980's, earth scientists helped medical scientists to recognize that there was more than one type of material called asbestos, and that the different asbestos materials are not equally carcinogenic. Chrysotile asbestos, for example, is commonly regarded as being less carcinogenic than amphibole asbestos.

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Indicator Mineral Methods in Mineral Exploration

By Harvey Thorleifson, Minnesota Geological Survey Director

Indicator mineral methods rely on sampling of sediments such as glacial and stream sediments, and detection of mineral deposit indicators dispersed by mechanical processes. These methods are part of a spectrum of clastic sediment-based approaches ranging from boulder tracing to detection of detrital debris or their weathering products by chemical analysis of soil parent materials and sediments. These methods are part of the array of mineral exploration tools that we now use in the search for base metal, precious metal, and gemstone deposits.

Methods applied directly to prospective rocks at the preliminary stages of grassroots prospecting and the advanced stages of property evaluation include visual inspection, petrography, and lithogeochemistry. Intermediate between these phases of exploration are methods for remote detection of mineral deposits, achieved by geophysical or satellite observation, or by the detection of mineral deposit indicators transported from source.

Whereas application of exploration geophysical methods is directed at the mineral deposit and/or associated alteration by detection of electrical, gravity, magnetic, seismic, or thermal properties, geochemical and indicator mineral methods involve tracing of material dispersed from source. Whereas purely geochemical methods rely on indicators dispersed from source by aqueous and/or gaseous chemical processes, indicator mineral methods are based on clastic indicators that have been dispersed from source by mechanical means alone. Elemental analyses of soil parent materials and sediments may be used to detect a combination of chemical and clastic signals, although a survey usually is directed at one signal or the other.

For example, the B horizon might be sampled and appropriate analytical procedures applied to seek a dominantly chemical signal, while the C horizon might be sampled and analyzed to seek primarily a clastic signal residing in mineral grains or their weathering products. In the case of visible indicator mineral grains, the signal is attributable to mechanical dispersal processes alone.

The scope of these mineral-grain-based methods is expanding from well-established procedures, such as those for gold grains and kimberlite indicator minerals, to new approaches for targets such as base metals. A key element of survey design is selection of an appropriate sampling medium, and consistency in its application.

These methods are currently being applied throughout Minnesota by Minnesota Geological Survey staff, in cooperation with industry. This public-private partnership will result in publication of data that otherwise would be confidential. The data that will be published over the coming two years will not only be useful in mineral exploration, but will also provide new insights into our geology that will guide thinking on many topics, such as the source of arsenic in our drinking water.■

Edward Parris Burch *(1870-1945) founded the Geological Society of Minnesota in 1938. Graduating from the U of M in 1892, with a degree in Electrical Engineering, he went to work for Thomas Lowery and the Twin Cities Rapid Transit Company. His job was installing electrical equipment, during the Company's conversion from horse-power to electricity. In 1900, he began a consulting business, which took him all over the US. He was asked by the Minnesota Federation of Engineering Societies to write an article describing his work since his "retirement" in 1933. This is a reprint of that article, which was reprinted in the GSM Newsletter in 1943.*

The Request on behalf of the Bulletin for an Article on the Particular Circumstances and Personal Bents which led to the Adoption of and Concentration on, Geology as an Avocation

I began Engineering work after graduation from the University of Minnesota in 1892. After forty-one years of steady and hard work, including some pioneer work in electrical engineering, I was up against a stone wall. Business was bad, a post-war depression was on, and consulting engineering was in a trough. My major business had consisted of handling difficulties, and making the best of bad situations, of others. But here was a real personal problem. How could this depression be solved?

After two years, I decided to quit, and to save $130.00 per month in office rent and typist costs. [Note: He had an office in the "new" Foshay Tower]. I wanted to get out-of-doors, winter and summer. But I must prepare, and find something which would take me out. I had sufficient money, and no dependents, except my wife, and no worries. We had traveled, largely by auto, in every state of the Union, and over most of Europe. We liked to travel for its educational values.

My work during 1893 had included the setting of trolley side-poles in downtown St. Paul, where compressed air was needed to drill through the hard Platteville Blue Limestone, and again in 1896 and 1897, during the conduit construction for the lower dam at St. Anthony Falls, the same limestone and the St. Peter White Sandstone below it, had been encountered. I began to ponder, and to study. Were these sedimentary layers continuous, and level, and if not, what deformed them? And what was below them? How thick were they and how far did they extend beyond the Twin Cities?

A report on the proposed artesian well water supply, by Sven A Norling, dated 1931, held particular attention because it furnished the deep-well records in and beyond the Twin Cities. I made a large the dimensional model of the underlying rock formations between St. Cloud, St. Croix Falls, Hastings and Chaska. As my interest grew, I saw the need of greater preparation.

In 1932, I registered in the Department of Geology at the University for a three-year course. My only study was geology – not one hour per day, but six hours, under Professors Schwartz, Thiel, Dutton, Gruner, Stauffer and Emmons.

It was pretty hard to begin all over again, at 62, in classes with youngsters, but I stuck it out, 6 to 8 hours on weekdays, field trips on Saturday and Sunday, and during two summer vacations, with Professors on geological surveys. Then I visited the lava flows on the North Shore of Lake Superior, the iron mining regions and throughout the states of Minnesota and Wisconsin. Five winters were spent in Florida and California studying the rock formations, marine shells and fossils in a careful, systematic way.

Continued on page 5

Continued from page 4

In Mineralogy, a collection was made of the common minerals and ores, placing them in a large cabinet, properly labeled and cross-indexed.

In 1936, I registered at the School of Mines and took a course in ore assaying under Professors Pease, Christianson, and Appleby.

In 1937, I registered at the University of Arizona, at Tucson. The leading mineral state of the Union, is Arizona, and the University has a splendid collection of world-wide rock and mineral specimens. There I learned more of mineralogy, mining and the technique of rock structures.

Back to Minneapolis in 1938, I organized the Geological Society of Minnesota, and gave lectures, on Monday Nights in winter and during the weekly field trips in summer, for over three years. The Society is now incorporated as an educational institution, and it has had a remarkable growth. It is composed largely of teachers, doctors, lawyers, engineers, accountants and retired men and women who have taken courses in geology at the University, and who desire to extend their knowledge.

The field trips have been helpful. We first found the outcropping rocks of the sedimentary formations near the Twin Cities, and then made radial trips for new formations to southeastern and southwestern Minnesota, to St. Croix Falls, to the Iron OreRRanges, to the northwest shore of Lake Superior in Canada, and along the southwest shore to the Keweenawan Copper District. Also, along the Minnesota River from Mankato to the Ortonville Granite Districts. One trip, with thirty-four members in automobiles, was made to the Black Hills for mineral specimens. Another was to Yellowstone Park for a week's outing. These trips combine fun, fishing, and scenery for nature groups.

The geology of regions at a distance has given us material for our lectures. The regions studied by members have included Boston, New York, Florida, Colorado, Arizona, California, the Black H ills, Grand Canyon, Rocky Mountains, and Scandinavia and the minerals of the South Seas.

And now, after ten years devoted particularly to geology, and when the light was breaking through on some hard problems, another World War comes on, and this has curtailed our plans. But we carry on, with restrictions on gasoline and rubber, and without our young men. We still collect rocks and ores, minerals, fossil shells and we make models.

Retirement involves some preparations, and a study of the things you like to do. To enjoy an avocation requires work, and enough of fun to compensate one in the solution of problems. It seems quite necessary, with geology as an avocation to: hustle out in the morning, wear old clothes on a trip, select a good camp, cabin or perhaps sleep on a lava bed, always get chilled on a mountain top, learn to avoid marshes, divide with the ants and be eaten by mosquitoes, and to go to be dog-tired, all in order to gain in experience for just another problem. To become a member of an alert and eager group of men and women and to be able to share in their leadership, and in their cultural life, has been a challenging experience. New worlds have opened up to enrich and broaden our lives. The work at times has been hard, exacting and discouraging, but, in such voluntary service, how much better it is to wear out than to rust out.■

BOOK REVIEW by Katy Paul

The Seashell on the Mountaintop: How Nicolaus Steno Solved an Ancient Mystery and Created a Science of the Earth, by Alan Cutler

Imagine that you know absolutely nothing about geology, fossils, plate tectonics, chemistry, and science in general. If you could do that, you would be on equal footing with most people living in 17th century Europe. Without this mass of ignorance, it is quite difficult to keep from scoffing at some of the beliefs held, way back then. In reading this book, I was amazed at what the 17th Century citizen did not know. So much knowledge is taken for granted in this – the 21st Century, that I had to attempt to "unknow" everything about geology that I have learned up to this date.

So, with a blank slate, here is an example of a well-known fact from the 17th century: The earth was created on a Sunday, Oct. 23, 4004 B.C. James Ussher, an Anglican Archbishop in Ireland had figured that out, based on the "historical facts" in the Bible.

Here's another fact: Mountains, valleys, rivers, glaciers – all were the same in the 17th century as they were on Oct. 23, 4004 B.C. There was no point in asking how a mountain was formed. They were just created, along with everything else.

What about those rocks that look like seashells? How did they get on the tops and slopes of mountains? They couldn't possibly be real seashells, since the sea wasn't anywhere near the mountain tops. They were, in fact, mere rocks that only looked like shells, one of natures many mysteries. Or maybe they were dropped on the mountain tops by Noah's flood, but that theory couldn't explain how the shells got *inside* the rocks.

In 1665, Neils Stensen, known as Nicolai Stenonsis in academia, and Nicolaus Steno to his friends, was a student of anatomy. In his study of medicine at the University of Copenhagen, he had become well known for his skill in dissection, and had ferreted out many previously unknown glands, muscles, nerves, and tendons during his very popular dissections of the human body. (There was always an audience of eager young students.) The Medici brothers, Ferdinando II and Leopoldo heard about Steno and invited him to join their Academia del Cimento, or Academy of Experiments.

Over many years the Medici's had been patrons to great artists and philosophers in Florence, Italy. The Cimento supported careful, objective experimentation without dogmatism and speculation, with all expenses paid. Steno would be offered no end of new opportunities. His first assignment, in 1666, was to dissect the head of a great white shark that had been dragged onto shore and clubbed to death, near Livorno.

Here is another intriguing fact from the 17th century. People used to find curious, small stones lying about on the ground. These were called glossopetrae, or "tongue stones". Tongue stones were prized for their curative, even magical powers. They were worn as charms to ward off

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Just Around the Corner

Well, the April 25th Kimball Memorial Banquet signaled the end of this season's lecture series and the beginning of our field trips, and of course, our sessions in the GSM State Fair Information booth can't be far behind. Although the Fair doesn't start until August 25th, it's not too early to start planning.

In the next two months the Show and Exhibit Committee will be putting together a list of workers for the Fair booth. We will need 72 people, each to work a 4-hour shift at the fair.

The Fair starts on August 25th and ends on Sept. 5th. Each day will be divided into three shifts: 9am to 1pm, 1pm to 5pm, and 5pm to 9pm. Two people will be required for each shift.

We know it's a little early, but this is your opportunity to get the best time. Call Tom Schoenecker at 952-474-4600 and he'll give you the spot you crave. Hurry! You should know, if you don't call Tom, he will call you. Be nice to him.

Remember it's a lot of fun and you don't have to be an expert. You just have to show your enthusiastic interest in Geology and if you can't answer a question, invite the person to a lecture where he or she can ask the experts. We will have some new rock specimens this year and other changes to our display. Our job at the Fair is to hand out our lecture schedules and to invite those with an interest in Geology and Rocks to join us at our lectures and field trips. Please also remember, the Fair is our main source of new members. ■

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Book Review, ***continued from page 6***

everything from spells to infants' teething pain. Elixirs made from ground up glossopetrae were sold as remedies for assorted "plagues, ill disposed fevers, burns, poxes, pustules," as well as labor pains, epilepsy, and bad breath. The best and most famous came from Malta and were used as an antidote to poison. Because tongue stones were often found scattered on the ground, many people assumed that they fell from the sky. And since they were most plentiful after heavy rainstorms, some believed they were jagged shards of lightening bolts. Steno's dissection of the shark's head told him what he had already suspected. Glossopetrae were nothing more than fossilized shark's teeth.

Steno gradually drifted away from medicine, and focused on the earth, and how rocks and fossils were formed. He found order in the earth's structure. He found the logical rules by which the faulting, uplift, erosion and stratification of a landscape and the bedrock beneath it could be put into an intelligible sequence. He recognized that the accumulated layers of rock that entombed fossil shells had begun with the gradual accumulation of sediment which in time, buried the shell. The lowest layer had formed first, the highest last. Depending on the fossils and their sediments, the layers recorded the succession of seas, rivers, lakes, and soils that once had covered the land.

Today, geologists call Steno's insight the "principle of superposition." Steno outlined his theory in a 78 page manuscript called "De Solido" (On Solids) which was originally intended as an abstract of a longer and more detailed dissertation, but alas, it never materialized. The De Solido was his last published geological work. Curiously, after a few years, Steno converted to Catholicism and became a priest, and gave up scientific research altogether.■

Continued from page 2

Controlled studies have shown that adding one part per million of fluorine to domestic water can improve dental health for children by reducing tooth decay. But in some regions of the world, concentrations as high as 4 parts per million of fluorine exist in the water naturally. These high concentrations have been shown to cause mottled teeth, osteosclerosis, limited movement of the joints, bowlegs, and spinal curvature.

The link between geology and iodine deficiency diseases is well known. Iodine deficiency is the world's most common cause of mental retardation and brain damage. And in recent years, water hardness has been suspected of impacting cardiovascular diseases. At present there appears to be mounting evidence for the role of magnesium present in the hard water, as a cardioprotective element.

In rural, or pre-industrial societies, geophagy – the practice of eating clay or soil – is done to supplement mineral-deficient diets. Some varieties of clay are eaten, mostly by pregnant women in the tropics, and also by some animals such as horses, monkeys and birds. The clay can contain important nutrients such as: phosphorus, potassium, magnesium, copper, zinc, manganese, and iron.

Exposure to toxic levels of trace elements is one of the widespread forms of environmental health problems. Millions of people worldwide suffer health problems because they have been exposed to arsenic, lead, fluorine, mercury, uranium, etc. Collaborations between the geoscience community and the biomedical and ecological research communities have great potential to help understand, mitigate and possibly eradicate environmental health problems that have plagued humans for thousands of years.▪

Geological Society of Minnesota 1938

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